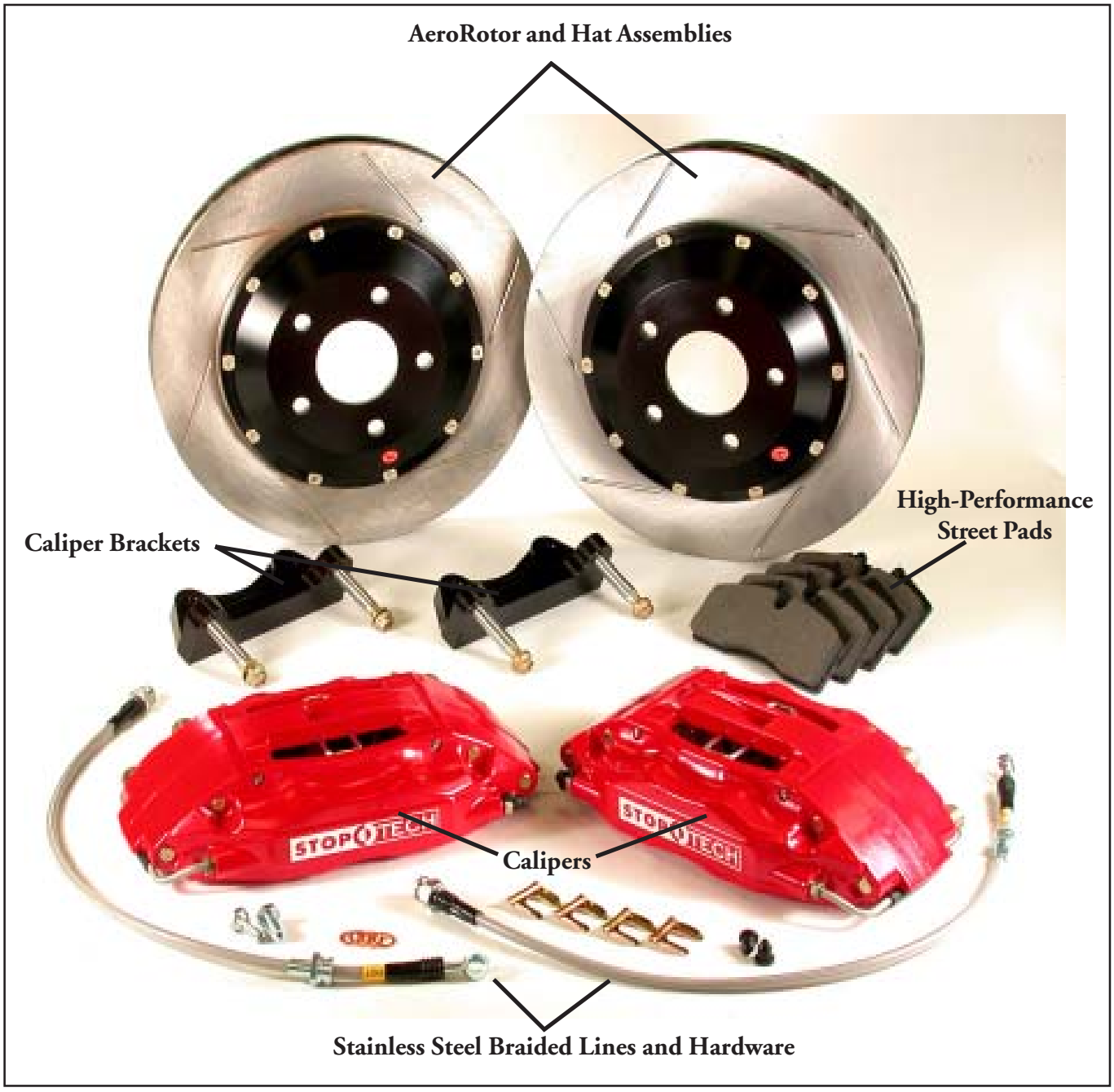
Installation Instructions
2000+ BMW E39
M5 and 5-Series

355mm Rear
Big Brake Upgrade
ST-40 Caliper

STOPTECH
HIGH PERFORMANCE BRAKE SYSTEMS

COMPONENT IDENTIFICATION



BMW E39 M5 and 5-Series Rear Big Brake Kit

This is a representative photograph. The actual components in your kit may appear slightly different.

APPLICATION DISCLAIMER

Permanent Removal of Dust Shield

The dust shield must be permanently removed from both rear wheels of the vehicle, to accommodate the AeroRotors. This involves cutting each shield with sheet metal snips or a power cut-off wheel, and de-burring sharp edges with a file or power die grinder. These operations can be dangerous, and serious injury can occur. For anyone who is not competent or comfortable performing these operations, StopTech firmly recommends that they seek the services of a trained professional. Proper precautions, such as safety glasses and work gloves, will be required.

Note: Please refer to page 10, to review the process for removing the dust shield BEFORE beginning the installation.

Caliper Clearance

Most 17" wheels will clear the outer diameter of the caliper for a 328mm or 332mm rotor kit. For a 355mm kit, a minimum 18" wheel is typically required, and for a 380mm rotor kit, a minimum 19" wheel is needed. The more critical clearance, however, is the gap between the spokes of the wheel and the face of the caliper. Do not assume that a larger-diameter wheel will automatically clear the face of the caliper. ***The actual metal-to-metal distance, measured from the stock rotor face to the inside of the wheel spokes, is 65.40mm for the 2000+ BMW E39 M5 and 5-Series rear kit. StopTech recommends at least 2mm of additional clearance.*** **See the Wheel Fitment Drawing page on the StopTech website for more specific measurements, at www.stoptech.com.**

Note: Final fitment of the wheel to the caliper is the responsibility of the customer.

Brake Vibration - THIS IS IMPORTANT!

The most common cause of brake vibration is improper bed-in of pads and rotors, or improper pad selection for the specific driving environment. Rotor run-out may also cause vibration, but precision manufacturing and inspection typically mean that run-out is not an issue. Modern production methods ensure that the rotor run-out is within +/- 0.002" when installed on a StopTech aluminum hat, and it controls thickness variation to within 0.0003". Under the most extreme conditions, any rotor may warp, but uneven pad deposition is a more typical cause of vibration. If the system is not properly bedded-in, or if street pads are run on an open track, uneven pad deposits will occur, causing an ever-worsening vibration. Failure to immediately address a pad deposition/vibration issue may lead to permanent damage of the rotors. Please read and understand the bed-in procedure included in this manual. If you have any questions, please contact the StopTech Customer Service Department on (310) 325-4799 - extension 105, or you can e-mail directly to support@stoptech.com.

Note: StopTech is not liable for vibrations caused by extreme usage or improper bed-in of pads and rotors.

APPLICATION DISCLAIMER (Cont'd.)

Wheel Spacers

Wheel spacers can provide extra clearance to the outer face of the caliper. This will also space out the entire wheel, widening the track width of the vehicle. Fender clearances should be checked on lowered cars, and longer lug studs or wheel bolts are usually required.

Note: The Wheel Industry Council has issued guidelines advising that wheel spacers not be used. It is the responsibility of the customer to ensure that wheel spacers are properly specified and installed.

Brake Noise

Certain brake pad compounds make more noise than others. Proper anti-squeal shim plates between the caliper pistons and backing plate of the pad help to reduce the problem. Anti-squeal lubricants are also available, to reduce some of the noise. The reality is that performance pads are more prone to brake squeal.

Note: The customer is responsible for any squeal-related problems due to pad selection.

Caliper, Hat and Bracket Finish Disclaimer

Many wheel-cleaning solutions contain strong acids that may damage the finish on any caliper or aluminum anodized finish, especially the plating on the hardware. Check for adverse effects by trying a small amount of the cleaner in question on an inconspicuous area. Avoid over-spraying, and rinse cleaning solutions off as quickly as possible. StopTech is not liable for damage to calipers, hats or bracket finishes, due to corrosive chemical exposure.

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Important Notices

Wheel Fitment

Do not assume that your wheels will fit. An outline drawing of your StopTech Big Brake kit is available on our website at www.stoptech.com. Measure the distance from the outer face of your stock caliper to the inner face of your wheel spokes, or make a template according to the instructions on the website, to determine if a wheel spacer is necessary. DO THIS BEFORE YOU INSTALL YOUR KIT!

Cleaning of Rotors

The AeroRotors supplied with this kit are coated with a water-soluble, environmentally friendly rust inhibitor. This coating MUST BE WASHED OFF WITH SOAP AND WATER before installation. Brake cleaner is not as effective as soap and water. Even if it doesn't look as if anything is coming off the rotor, the rust inhibitor is there, and must be entirely cleaned. Rotors will quickly rust without protection, so if the rotor is not rusty, it's still coated. After cleaning, you may see the rotor start to develop a slight rust color. This is normal, and indicates that all of the rust inhibitor has been removed.

Rotor and Pad Bed-in

Proper rotor and pad bed-in is essential to the performance of your new brake system. Failure to properly bed-in the brakes will seriously impact how well they work, and how long they will last. The number one cause of brake vibration is uneven pad material deposition on the rotor. Proper bed-in will greatly minimize such problems. Follow, as closely as possible, the bed-in procedure detailed later in this manual, or refer to the StopTech website at www.stoptech.com for further information.

Safety Notice

Improper handling of a vehicle, especially while raised and supported by jack stands, ramps or other mechanical means, can cause serious bodily injury or even death. It is strongly recommended that a trained, experienced mechanic, with proper equipment, install the Big Brake Kit supplied by StopTech LLC. StopTech LLC assumes no liability, expressed or implied, for the improper installation or use of this product or its components.

Liability No Warranty

Automobile racing and performance driving, whether sanctioned or not, on or off the road, are dangerous. Products used in such environments/applications are subject to stresses and conditions outside of normal use, wear and tear. All equipment sold or provided by StopTech LLC is sold WITHOUT WARRANTY, EXPRESSED OR IMPLIED. No warranty or representation is made to the product's ability to protect the user from injury or death. The user assumes all risk. StopTech LLC is NOT responsible for any damage, consequential or otherwise, for equipment failure or mal-performance after installation. Under no circumstances is StopTech liable for labor charges or loss of use.

Contact StopTech

If you have any questions about wheel fitment, rotor cleaning, or bed-in of a particular pad type, please call StopTech's Customer Service Department on (310) 325-4799 - extension 105, or you can e-mail directly to support@stoptech.com.

BMW E39 M5 and 5-Series Rear Axle Kit

Note: It is important to read and understand this ENTIRE installation manual, including the break-in procedures, before starting the installation.

Kit Contents

Your StopTech Big Brake kit includes the following:
1 pair of ST-40 four-piston calipers, sized specifically for your vehicle
1 set of high-performance street pads (not suitable for track use)
1 pair of 355 X 32mm two-piece rotor assemblies
1 pair of aluminum caliper adapter brackets
4 ea. 7/16-20 self-locking jet nuts
4 ea. 12mm washers
1 pair of stainless steel brake lines
2 ea. rubber end caps

Tools and Equipment Required

Some different models or years of vehicle may use different sized fasteners. Every effort has been taken to correctly identify the proper sized tool for each job. Occasionally, the manufacturer may use an alternate fastener. Check that each tool correctly fits the fastener before loosening or tightening it. The following tools and equipment will be needed:
16mm wrench or socket with extension (1/2" drive suggested)
14mm wrench or socket (in some cases, 9/16" may be required)
14mm flare wrench
11mm flare wrench
11mm box wrench
1/2" socket (3/8" drive suggested)
6mm Allen (hex) wrench
5mm Allen (hex) wrench
Torque wrenches capable of 10-85 lb-ft settings
Sheet metal snips or cut-off wheel, and a file or die grinder
Needle-nose pliers
Safety glasses and work gloves for the metal-cutting process
Small drip tray or several rags
Small funnel or suitable means of filling master cylinder reservoir
Anti-seize compound
Brake bleed bottle
1 pair of jack stands or other means of supporting vehicle
Plastic or non-marring mallet
DOT 3 or 4 Brake Fluid. Check manufacturer's recommendation for compatibility. StopTech recommends flushing brake fluid every 1-2 years, or more often under severe usage conditions. If not done recently, the installation of a brake kit is an excellent opportunity to refresh your brake fluid, or to upgrade to a higher-performance fluid, such as Motul 600.

Step 1
Raise Vehicle, and Remove Wheels

Note: All photographs show a right-hand side installation, unless otherwise noted.

A level, stable and clean surface, suitable for supporting the vehicle on jack-stands, should be used for the installation.

Warning: Never leave any vehicle supported with only a jack. Always use jack-stands.

Break loose the lug nuts on both rear wheels before jacking up the car. For a rear kit installation, block the front wheels, and release the parking brake.

Refer to the Owner's Manual to identify the correct location of the jack for raising the vehicle. Jack up the vehicle, and secure it on a pair of jack stands, again referring to the Owner's Manual for jack location joints.

After securing the vehicle at a convenient height, remove the rear wheels.

Step 2
Disconnect Stock Brake Line

Warning: Brake fluid will damage most painted surfaces. Immediately clean spilled brake fluid from any painted surface. Also be sure that the cap is securely installed on the master cylinder. If the cap is loose or removed, it is likely that more fluid will drip during brake installation.

Place a drip tray or several rags directly below the inboard brake line connection. If the area around the brake line connection to the chassis is dirty, clean it using brake cleaner or an appropriate cleaning agent.

Loosen the hard line fitting from the stock brake line, using an 11mm flare wrench on the hard line fitting, while using a 14mm line wrench to hold the stock brake line fitting.

Remove the hard line fitting, and place one of the rubber caps over the end of it, to control fluid loss during the installation.

Note: Retain the rubber washers which are located on either side of the hard line bracket, taking care to note their orientations, and to keep them properly identified, so that they can be reinstalled correctly later.

Step 3
Remove Stock Caliper & Rotor

Carefully remove the stock pad-wear sensor from the caliper, and place it out of the way temporarily, so that it will not be damaged.

Note: Take care to ensure that the metal clip which is located around the outside of the pad-wear sensor does not come loose and get lost.

Remove the two stock caliper bolts, using a 16mm socket, which is fitted with an extension.

Note: Factory-installed caliper bolts may be very tight. Ensure that you have a good purchase on the head of the bolt, and that you are in a good position to turn the wrench or socket.

Remove the caliper with the stock brake line attached. There may be some leakage from the open end of the brake line, especially if the pads/pistons on the caliper are retracted.

Remove the rotor-retaining screw, using a 6mm Allen wrench, and retain the screw for later use. Then pull off the stock rotor.

Note: Some M5 versions have two rotor-retaining screws.

If the rotor-retaining screw will not come loose, use an impact driver, or seek the help of a qualified technician. **Do not strip the screw head.**

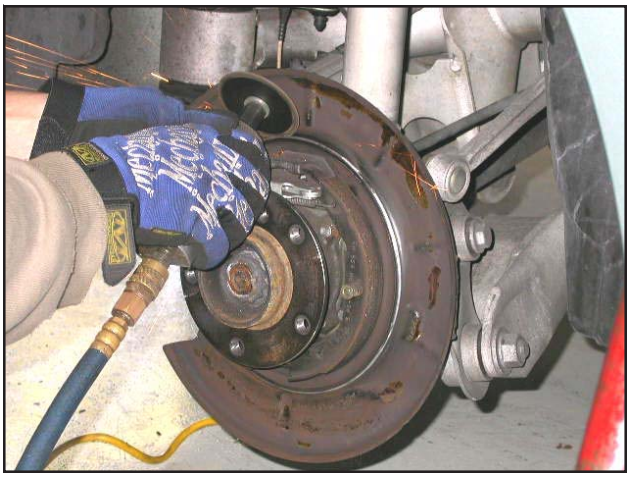
Note: It may be necessary to strike the outer edge of the rotor with a non-marring mallet, if corrosion prevents the rotor from simply being pulled off. If so, place a wheel bolt in one of the holes first, to prevent the rotor from falling when it comes loose.

Step 4
Remove Dust Shield

The dust shield must be permanently removed from both rear wheels of the vehicle, to accommodate the AeroRotors. This involves cutting each shield with sheet metal snips or a power cut-off wheel, and de-burring sharp edges with a file or power die grinder.

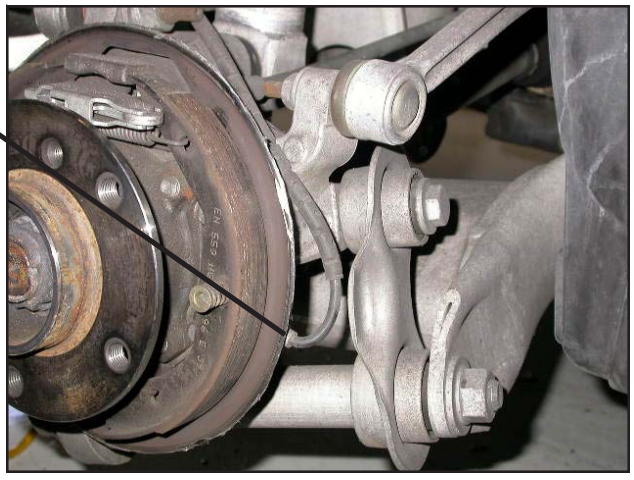
Warning: These operations can be dangerous, and injury can occur. For anyone who is not competent or comfortable performing these operations, StopTech recommends that they seek the services of a trained professional. Safety glasses and work gloves should always be worn during metal-cutting operations.

Use a marking pen to trace a cutting route around the lip of the dust shield, where the caliper bracket mounts.



Warning: The ABS sensor lead is located directly behind the dust shield. Take care not to damage it when cutting or removing the shield.

Cut around the entire circumference of the dust shield, using a cut-off wheel or sheet metal snips.



Remove the dust shield, and carefully de-burr any sharp edges, using a file or power die grinder.

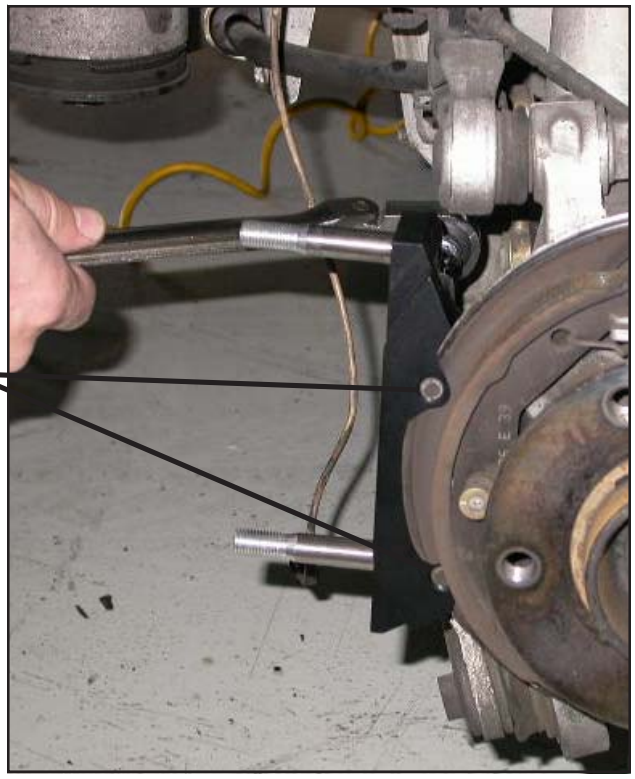
Test-fit the rotor, and turn it to check that no remaining part of the dust shield comes into contact with it.

Step 5
Install Caliper Bracket

Remove the jet nuts and washers from the caliper bracket, and put them in a safe place for later use.

Install the caliper bracket, using a 16mm wrench or socket to tighten the stock caliper mounting bolts.

Torque the bolts to 50-55 lb-ft.



Step 6
Install AeroRotor Assembly

AeroRotors *MUST* be cleaned with soap and water prior to installation (soap and warm water work best to remove all traces of rust inhibitor, but brake cleaner can be used as an alternative, if necessary). Not cleaning the AeroRotors will damage the rotors and pads, and will prevent the brakes from performing properly.

Even though the rotors may look clean, the rust inhibitor is in place, and it must be removed. Not cleaning the rotors will severely impact the performance of your new brake system.

Warning: Do not skip this step!

Scrubbing the AeroRotor, using a ScotchBrite pad, soap and water.

Install the hat and rotor assembly, ensuring that the rotor is seated squarely on the hub face. If necessary, clean the face of the hub, using a wire brush or similar means.

Use the stock rotor-retaining screw, to secure the rotor in place, and tighten it using a 6mm Allen wrench.

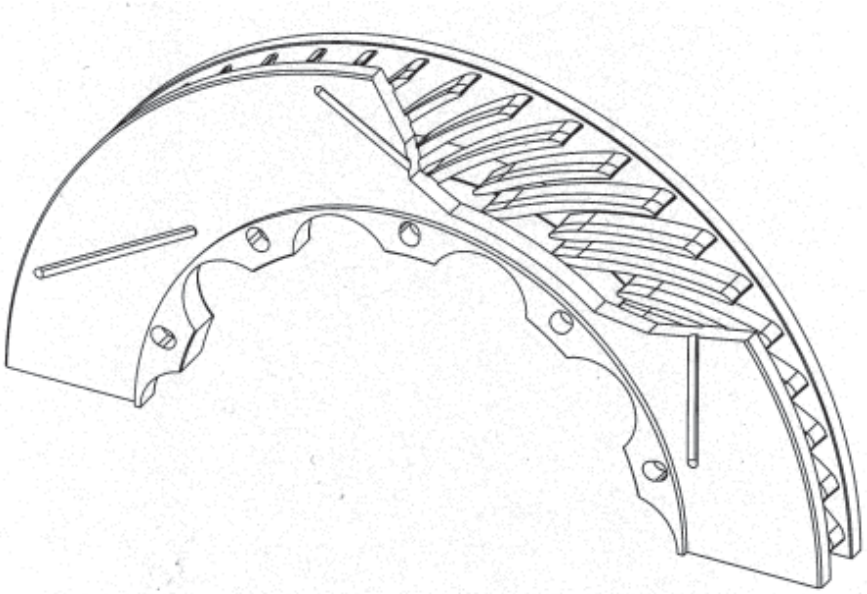
Note: Take care to ensure that the rotor assembly is on the correct side of the car, as reversing the rotors will severely decrease the cooling capacity of the system. The rotors are clearly marked "L" and "R" with orange tags on the rotor hats. If the tags are not legible, the vanes inside the rotor should lean toward the rear of the car on the top side of the rotor (see the following pages for more-detailed images).

Left-Side Rotor

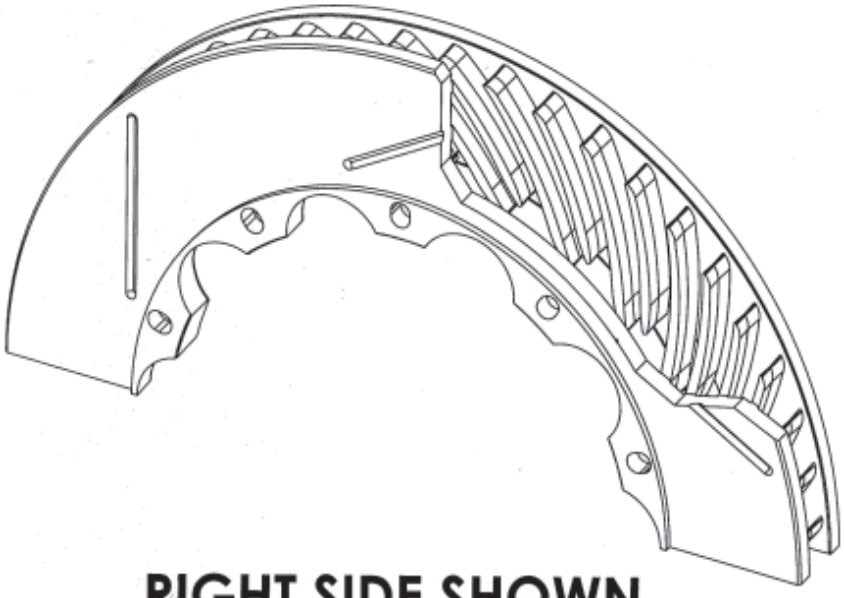
Driver's Left

Right-Side Rotor

Driver's Right

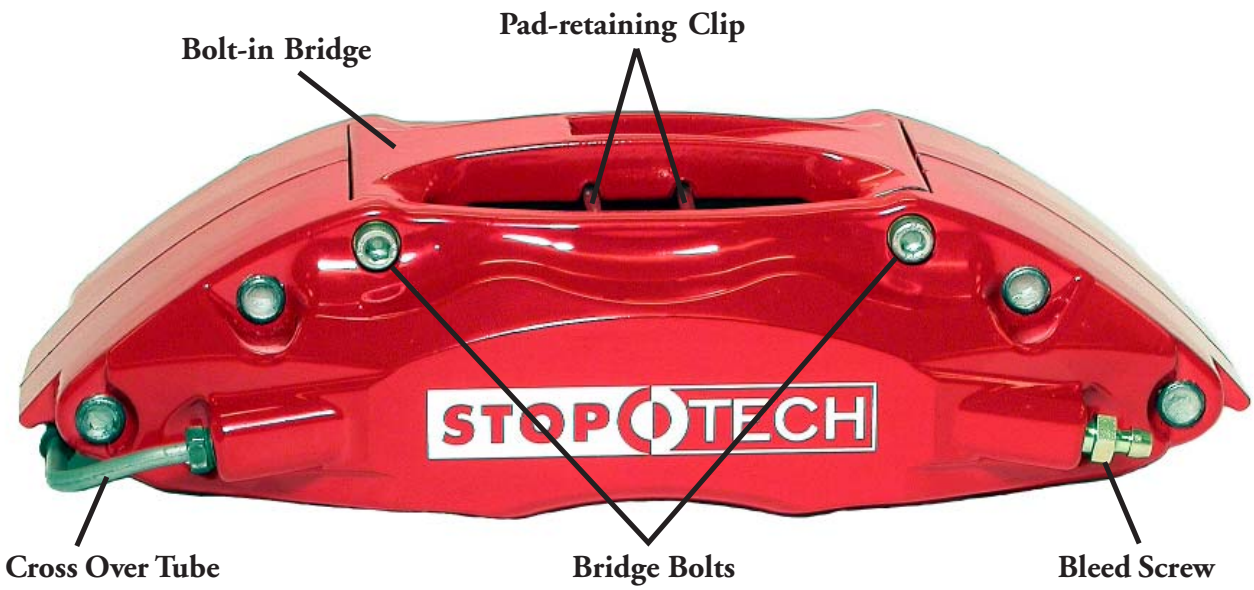


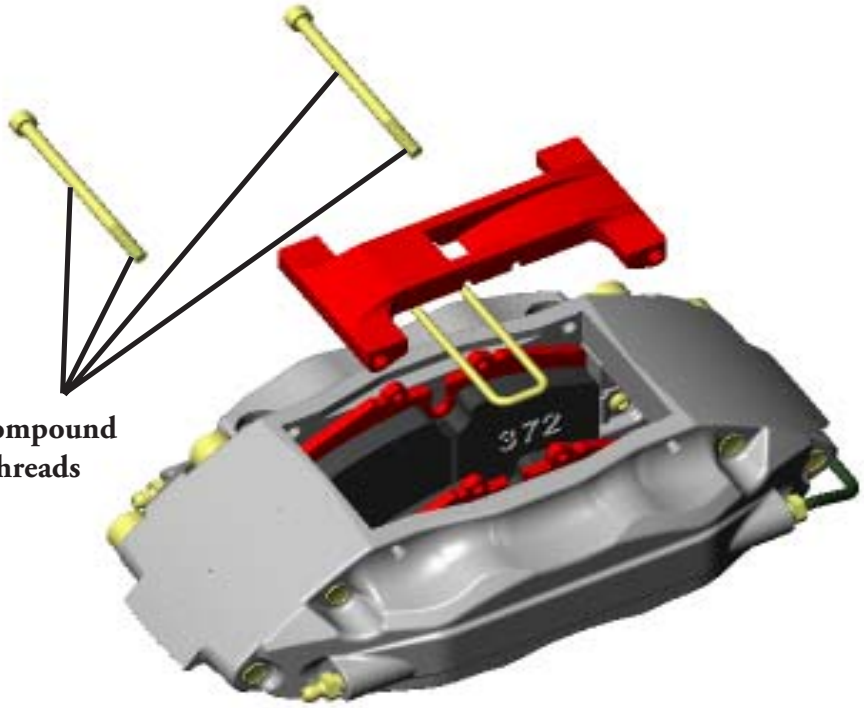
LEFT SIDE SHOWN



RIGHT SIDE SHOWN

Caliper Component Identification





Use a light film of anti-seize compound on the bridge bolt shafts and threads

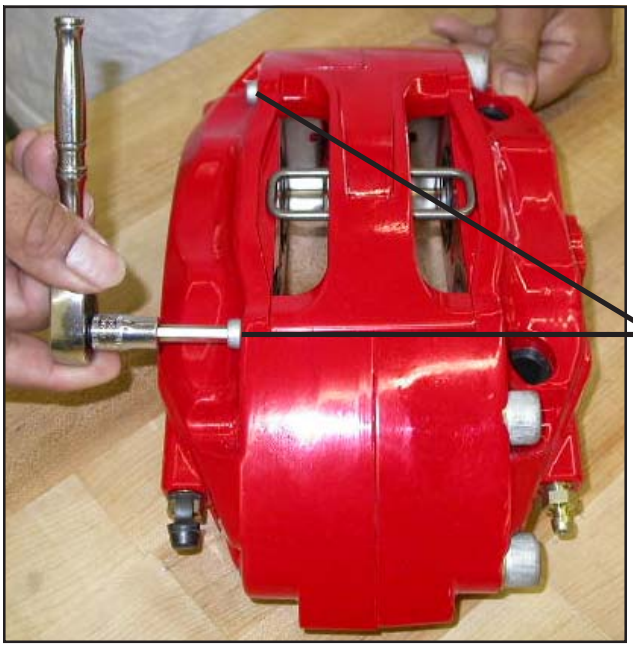
The ST-40 original equipment caliper uses a pad that is common to two-piston opposed calipers. The Friction Materials Standards Institute (FMSI) number for the pad backing plate is D372.

For further pad interchange information, please see the FAQ section of the StopTech website at: www.stoptech.com

Step 7
Install Caliper and Pads

Note: The images in this section may not be of the vehicle noted, but they give a proper representation of the correct installation.

Determine the left- and right-hand side calipers. They are clearly marked on the box, but as a check, the bleed screws are always positioned at the top of the caliper. If installing a four-wheel kit, with ST-40 calipers on the front and rear of the vehicle, be sure that the correct caliper is on each corner. The calipers with the smaller piston sizes go on the rear of the vehicle.



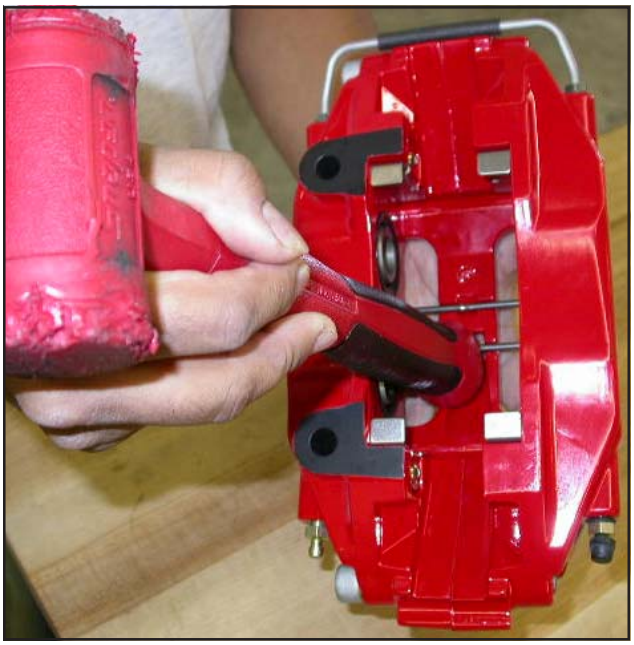
Remove the two bolts holding the caliper bridge in place, using a 5mm Allen wrench. Take care not to lose the washer that accompanies each bridge bolt.

Bridge Bolts

Remove the caliper bridge, taking note of the direction in which it is installed, and the correct location of the pad-retaining wire clip.

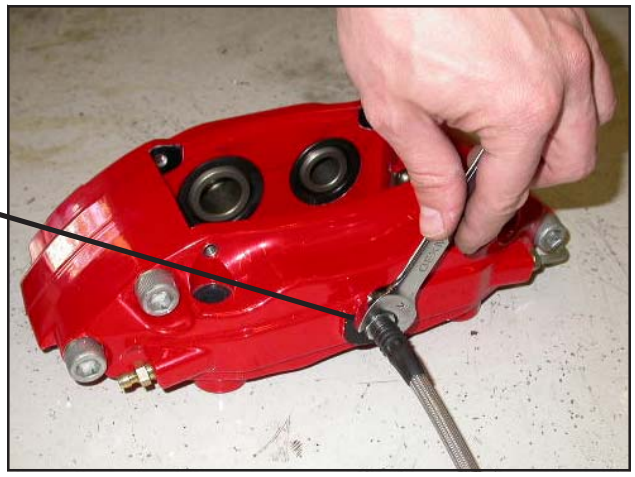
In order to stiffen the caliper, the bridge must have a snug fit, and the bolts may be tight when removing them. Keep turning the bolts gently, with pressure applied in the direction of removal.

After removing the bolts, it may be necessary to tap the bridge out from the inside of the caliper, using a mallet or similar tool (the handle of a tool works well for this). With use, the bridge and bolts will become easier to remove and insert.



Step 7 (Cont'd.)
Install Caliper and Pads

Install the stainless steel brake line onto the caliper, using a 14mm wrench to tighten the line fitting.



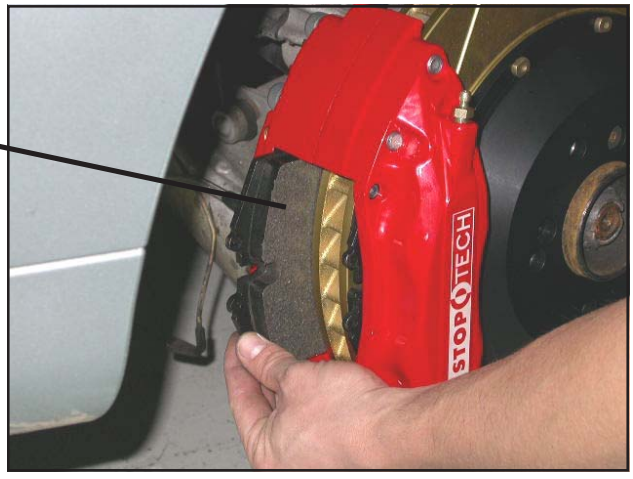
Install the caliper onto the adapter bracket, orienting it so that the bleed screws are on the top side of the caliper.

Take care to ensure that the caliper is square and evenly started on both studs. It may be necessary to use a mallet to gently tap the caliper into position.

Install the jet nuts onto each stud, with one 12mm washer under each nut. Tighten the jet nuts to 40 lb-ft of torque, using a 1/2" socket.

Slide the brake pads into position in the caliper, taking care to ensure that the friction side of each pad is facing the rotor.

(Yes, they've been installed backward before!)

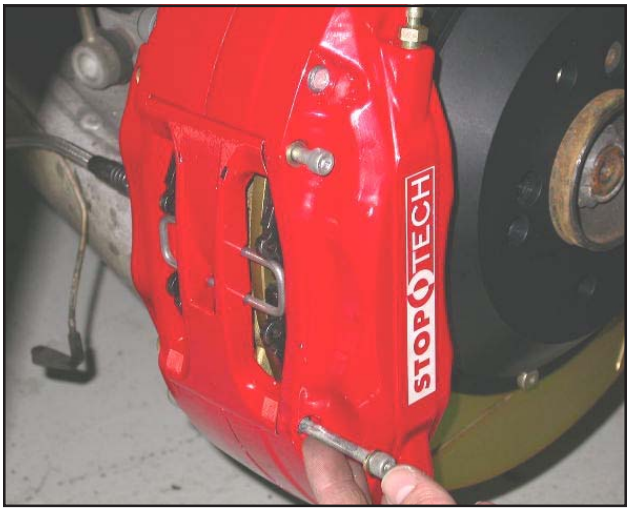


Step 7 (Cont'd.)
Install Caliper and Pads

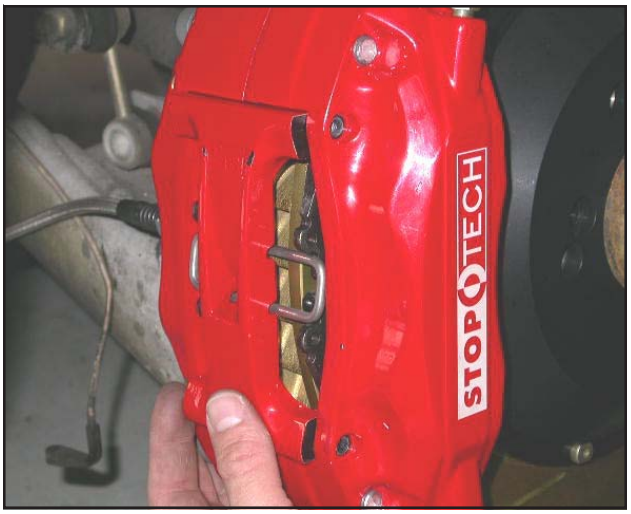
Install the bridge by sliding it into position, and rocking it until one of the bolt holes lines up.

Take care to ensure that the bridge is slid straight and parallel into the caliper body opening.

Note: The bridge is directional, and should be positioned so that the air-scoop opening is located in the bottom half of the caliper.



Once the bridge is securely in place, insert the stock pad-wear sensor into the inboard brake pad.



Insert the first bridge bolt, from the outside of the caliper, and start the first few threads, using a 5mm Allen wrench.

Start the second bolt, and apply pressure to the bridge, using the palm of your hand, or by gently tapping the bridge with a mallet, until the bolt engages in the hole. Start the first few threads, using a 5mm Allen wrench.

Warning: Do not hammer the bridge bolts into place. Tap the bridge, not the bolts!

Torque each bolt to approximately 8-10 lb-ft, using a 5mm Allen wrench. Do not use a torque wrench, as the use of anti-seize compound will cause a false reading. Do not over-torque the bridge bolts - snug is tight enough.

Step 8
Attach Stainless Steel Brake Line

Reinsert the rubber washers on either side of the inboard brake line bracket, then remove the rubber cap from the hard line, and screw the stainless steel brake line onto the hard line fitting by hand for a few turns.

Use a 14mm wrench to hold the stainless line inboard fitting, while using an 11mm flare wrench to tighten the hard line fitting.

Check to ensure that the brake line is not binding in any way, nor interfering with any suspension component. If necessary, loosen the inboard end of the line, and slightly re-clock the fitting.

Step 9
Bleed Brakes

Complete the installation on both sides of the vehicle before bleeding the system.

Warning: Double-check that the stainless steel brake lines you've just installed are not binding in any way, nor interfering with any suspension component, including the CV boot and the axle/ drive shaft. Adjust each line, if necessary, by loosening the inboard end of the line, and slightly re-clocking the fitting.

Note: The calipers and lines will need to fill with fluid, quickly draining the master cylinder reservoir. Keep a close watch on the fluid level when initially bleeding the system. Do not allow the master cylinder reservoir to run dry, and to draw in air. Doing so may result in the brake system needing to be serviced by a certified brake technician.

Bleed the brake system, using an 11mm box wrench to loosen the bleed screws. The sequence for bleeding the brakes should be:

1. **Right outboard bleed screw**
2. **Right inboard bleed screw**
3. **Left outboard bleed screw**
4. **Left inboard bleed screw**

Though a torque wrench is typically not used on bleed screws, as a reference, the torque for bleed screws should be approximately 100-140 lb/INCH.

After initially bleeding the system, gently tap the caliper body with a non-marring mallet to dislodge any small air bubbles, then re-bleed the brakes.

After bleeding, apply constant pressure to the brake pedal, and check all connections - including bleed screws, and both ends of the brake line - for leaks.

Warning: Brake fluid will damage most painted surfaces. Immediately clean spilled brake fluid from any painted surface, including the caliper. Though caliper paint is designed to resist harsh chemicals, prolonged exposure will damage the finish.

Step 10
Reinstall Wheels

It is very important to check the wheel-to-caliper clearance before installing wheels!

Note: Some wheels are balanced on the inside, with adhesive-backed lead weights. If the weight is on the outboard edge, behind the spokes, it may interfere with the caliper. If necessary, note the weight and location of the lead, and place a new piece of the same weight further inboard or outboard, to clear the caliper. If you rotate the tires regularly, check the lead weight positions on all four wheels, and also on the spare, if it is full-sized.

Reinstall the wheels, and torque the lug nuts to your wheel manufacturer's specifications. It may be necessary to snug the bolts before lowering the vehicle, and to then torque the wheel nuts when the car is on the ground. Alternatively, an assistant may depress the brake pedal while you tighten the wheel nuts to the proper torque setting.

Carefully test-drive the vehicle in a safe area, at low speed, to ensure that all components are working correctly. Then follow the pad and rotor bed-in procedure on the following pages.

STOPTECH
HIGH PERFORMANCE BRAKE SYSTEMS

AeroRotor™ Installation & Bed-in Procedure

READ THIS NOW

FAILURE TO READ, UNDERSTAND AND FOLLOW THESE PROCEDURES WILL CAUSE PERMANENT DAMAGE TO YOUR BRAKE ROTORS, AND WILL KEEP THE SYSTEM FROM WORKING AT ITS FULL CAPACITY.

The majority of brake system problems are due to improper installation and/or bed-in of the rotors and pads. By reading and understanding the following, you will avoid the most common causes of poor brake performance and vibration. FAILURE TO READ AND UNDERSTAND THIS MAY CAUSE SERIOUS PERMANENT DAMAGE TO YOUR NEW ROTORS.

Wash Non-Plated AeroRotors with SOAP AND WATER before installation.

StopTech coats non-plated AeroRotors with a water-soluble, environmentally friendly rust inhibitor that MUST be cleaned off before use. A non-plated rotor looks like bare metal, while plated rotors are bright silver in color, and do not need to be washed. Even though you may not see a change in the rotor color, if the rotor is not rusty, the rust inhibitor is there. Use soap and water, NOT BRAKE CLEANER to wash the rotors. A small piece of Scotchbrite works well for scrubbing. When cleaned and rinsed properly, the surface of the rotor may show a light rust color, which is normal.

Bed-in your new pads and rotors by carefully observing the procedure described on this and the following page.

Bed-in of rotors and pads is critical to the optimum performance of your new brakes. When bedding-in new parts, you are not only heat cycling the pads, you are also depositing a layer of pad material onto the rotor face. If not bedded-in properly, an uneven layer of pad material will be deposited onto the rotor, causing vibration. *Virtually every instance of a "warped" rotor is attributed to uneven pad deposition.*

Note: Plated rotors must be driven with gentle braking until the CAD plating is worn off of the rotor faces BEFORE starting the bed-in procedure. Do not use brakes aggressively until the plating is worn off, typically after several miles of driving.

Typically, a heavy-braking street driver will experience approximately 1 to 1.1G's of deceleration. At this rate, the ABS will be activated on such equipped vehicles. A moderate braking effort is needed to properly bed-in rotors and pads. If ABS intervention or lock-up were represented as 100% brake effort, a stopping force of approximately 70-80%, just short of ABS intervention or lock-up, is a general estimate of the pedal effort you are trying to achieve.

(Continued on next page)

Rotor and Pad Bed-in (Cont'd.)

Note: Bedding-in of pads should not be done in poor weather conditions, nor on wet roads.

After completing the installation, make a series of 10 stops from 60 to 5-10 MPH. At the end of each stop, immediately accelerate to 60 again for the next stop. Run all stops in one cycle.

During the 60 to 5-10 MPH cycle of stops, the exact speed is not critical. Accelerate to approximately 60, then begin braking. As you approach 5-10 MPH, it is not necessary to watch the speedometer. Keep your eyes on the road, and approximate your speed at the end of each stop. DO NOT COME TO A COMPLETE STOP, WHILE LEAVING YOUR FOOT ON THE BRAKE PEDAL, AS YOU MAY IMPRINT PAD MATERIAL ONTO THE ROTOR, CAUSING A VIBRATION.

If racing or higher-performance pads are being used, add four stops from 80 to 5-10 MPH, and if full race pads are being used, add four stops from 100 to 5-10 MPH.

There are several indicators to look for while bedding-in the system:

On the 8th or 9th stop, there should be a distinct smell from the brakes. Smoke may also be evident after several stops.

Also on the 8th or 9th stop, some friction material will experience "green fade." This is a slight fading of the brakes. The fade will stabilize, but will not completely go away until the brakes have cooled.

After the bed-in cycle is finished, there will be a blue tint on the rotor, with a light gray film on the rotor face. The blue tint indicates that the rotor has reached the proper bed-in temperature, and the gray film is pad material starting to transfer onto the rotor face. This is normal!

After the first bed-in cycle shown above, the brakes will still not be operating at their best capacity. A second or third bed-in cycle is typically necessary before the brakes really start to "come in." A "cycle" is a series of stops with a cool down in between each cycle.

StopTech does not endorse speeding on public roads. If going above the legal speed limit, do so in a safe area, away from traffic, and at your own risk.

After the final stop of each cycle, drive as much as possible without using the brakes, to cool off the system. Ideally, the brakes should be allowed to cool to ambient temperature before using them again.

DO NOT COME TO A COMPLETE STOP WHEN THE SYSTEM IS HOT, WHILE LEAVING YOUR FOOT ON THE BRAKE PEDAL. PAD MATERIAL MAY TRANSFER ONTO THE ROTOR, CAUSING A VIBRATION.

If you have any questions about rotor and pad bed-in, any aspect of your StopTech brake kit, or brakes in general, please contact our Customer Service Department at (310) 325-4799 - extension 105 or e-mail us at support@stoptech.com

Thank you for selecting StopTech.

We realize that you had a choice when selecting a big brake upgrade for your vehicle, and we know that you'll be happy with our system.

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